PREPARING FOR EMC COMPLIANCE

EMC testing a product is a complex process and far from just a paperwork exercise. RN Electronics' experienced engineers can assist you through all stages, from identifying the relevant standards to end of life compliance concerns. At our **Initial Assessment** days we will discuss the various standards and tests involved and give you access to all the information and techniques you need to pass. It is still best that you come prepared though & this guidance note is designed for that purpose.

Items you need:

- The product to be tested, including leads for all available ports (electrical connections), whether in permanent use or not.
- Any peripherals that may be connected to the product, e.g. printer, keyboard, mouse, relays, etc.
- Spare batteries and charger. If the product has a charging mode, bring some discharged batteries too.
- Chargers / PSUs are critical components, so if they are bought-in, then be prepared to swap for another manufacturer in case of failure (i.e. bring a stand-by with you).
- If the product is controlled, monitored or programmed from remote software, a laptop or PC with the software pre-installed.
- Any special tools required to open up the product and spare fuses. If the product is potted or sealed, then bring a second unit that isn't.
- A completed EMC questionnaire – details such as the internal frequencies, surge protection devices used, magnetic sensitive parts, etc. will determine the range of measurements to be performed.
- Electrical schematics, board layouts and components list.
- For any modules or bought-in parts used the data sheet and application note.
- Personnel capable of not only operating the equipment correctly, but also authorising any required changes.

Operating the product:

- Emissions

It is a requirement of the emissions tests to operate the product in a worst case mode from the point of view of any emissions that might be generated. I.e. it must be possible to exercise all functions to identify when emissions are generated. To save time it is permissible to create a test mode that exercises many functions at once even if they wouldn't normally be used together. There are, broadly speaking, two categories of emissions specifications. Class A products are intended for industrial use only and must be accompanied by a warning that they are not suitable for use in or near domiciles or light industry. Class B products can be used anywhere. All products are tested first for Class B, unless otherwise stated, as this is preferable.

- Immunity

It is a requirement of the immunity tests to monitor the product for its essential performance before, during and after each exposure. Some exposures are necessarily short, e.g. 3s or less, and repetitive; therefore it must be possible for the performance to be continually assessed every second or so, even if this means creating specialised software or hardware purely for the purpose of testing. The operation and monitoring of the product during these tests must be possible remotely (from outside the test chamber). CCTV is provided for, however any other required operation or monitoring will need to be arranged prior to test. The essential performance that is being monitored needs to be defined, including any allowed amount of degradation. E.g. temperature reading to remain within +/-10%. Each standard has different minimum performance criteria, but broadly speaking there are two types of phenomenon to consider. For continuous phenomenon, such as a strong RF signal presence (a Radio or TV broadcast for example), the product will need to continue to operate to some minimum standard the user might expect. For temporary or transient phenomenon, such as a dip in the mains power, the product might be expected to temporarily stop operating, but continue thereafter without any user interventions.

Support equipment:

Support items necessary to exercise the ports or monitor the equipment may be placed outside of the test area so as not to interfere or show up their own susceptibility. In this case sufficient cable lengths to route outside the chamber will be required, say 7m or more. Cables may be passed in/out of the chamber either through a connector panel (the connectors are filtered and may not therefore be suitable for all signal leads) or through a short metal tubular waveguide.

Cables:

Cables and connectors should be of the recommended type and maximum length for the user. If shielded, ensure the shielding is correctly terminated so as to enclose the entire cable right up the metal connector. A shield that is terminated instead by pig-tailing to an earth pin will not provide any effective shielding.

Cables may need to be lengthened / shortened or have the sheath removed for some tests. For automotive equipment a wiring loom of min. 1m length is required between EUT and battery. To correctly simulate vehicular transients, the loom will be cut down to 50cm.

Destructive tests:

Most EMC tests should not be destructive to the product, however there are some high potentials used, particularly in the fast surge test to mains and certain long signal leads. See also “Cables” above.

Schedules:

Tests are scheduled to start at either 9am or 1pm and each test session lasts 3.5 hours. I.e. 7 test hours to each day.

PREPARING FOR RADIO APPROVALS

In addition to the preparation for EMC testing above, radio devices require separate Safety and RF parameter testing.

Items you need:

- A paired transceiver, receiver or transmitter to enable a link to be established.
- A demodulated output from the receiver to enable monitoring of either a BER or the number of correct messages received in a given time frame (necessarily short) for receiver sensitivity measurements.
- Access to battery / power terminals for over/under voltage tests of the RF frequency stability and output power.
- All antenna types to be sold with the equipment.
- Access to the antenna port, for certain standards, even for integral antenna equipment – a second sample with a 50ohm connector soldered or otherwise attached to the base where the antenna would normally sit is acceptable.
- A completed radio questionnaire – items such as min / max operating environment conditions, frequency range, modulation scheme(s) and output power will determine the range of measurements to be performed.
- For event driven devices, details of transmitter on/off time for each possible message. It will be necessary to calculate the maximum possible usage (duty).
- For approvals in USA/Canada, a user manual and completed applications forms – details such as programming ports, other peripherals and the modulating pulse train will determine the range of measurements to be performed.

PREPARING FOR SAFETY ASSESSMENTS

Our Basic Safety Assessment (BSA) is a low cost product designed to minimise your effort and expense in self certifying. All we need is

- The product to be tested,
- A completed safety questionnaire,
- Information on any safety critical components, and
- A user manual.

Note. Critical components include but are not limited to transformers, power supplies, resistors-capacitors-RC units bridging insulation, X-caps, Y-Caps, EMI filters, surge suppression device, mains inlets/outlets, mains lead, internal wiring (live, neutral and earth conductors), opto-isolators, lithium batteries, DC-DC converters, thermal cut-outs, line switches etc. Please note, if previous approval information is available then include that in the data, otherwise provide datasheet for further investigation. For more information on safety critical components and how to choose suitable components please visit:
http://www.rnelectronics.com/safety-testing/choosing-suitable-components.html

Following on from the BSA, you may choose to have a Safety Type Test - aimed at producing a third party report against all relevant clauses of the product standard – or submit the product for an NRTL or CB certification through one of our partner organisations.

In these cases, items you will need:

- The product to be tested (modified per items identified in the BSA)
- Completed relevant third party application forms (e.g. NRTL, CB)
- Third party certificates for each safety critical component (identified in the BSA)
- Three samples of any critical components, e.g. transformers, which don't have 3rd party certification
- A user manual
- All electrical schematics